CLAIMS

1. A thermostructural composite structure having a compositional gradient, formed from a porous core (5) made of a refractory having a pore volume content of greater than or equal to 80%, said core lying between two intermediate layers (6a, 6b) comprising part of the refractory, a ceramic phase and a refractory solid filler, two external shells (7a, 7b) made of ceramic covering said intermediate layers.

2. The structure as claimed in claim 1, wherein the refractory of the porous core (5) consists of a refractory fiber reinforcement consolidated by a matrix.

3. The structure as claimed in claim 2, wherein the reinforcement comprises carbon fibers of the ex-rayon type bonded together by a carbon matrix.

4. The structure as claimed in any one of claims 1 to 3, wherein the intermediate layers and the porous core, on the one hand, and the ceramic shells and said intermediate layers, on the other, partly interpenetrate so as to anchor the intermediate layers in the porous core and the ceramic shells in the intermediate layers.

5. The structure as claimed in any one of claims 1 to 4, which has a bulk density of less than 1.

6. The structure as claimed in any one of claims 1 to 5, which includes a number of cavities (2), the walls of which form stiffeners (3).

7. The structure as claimed in claim 6, wherein the stiffeners have a wall thickness ranging up to 1 mm.

8. The structure as claimed in claim 6 or 7, wherein the stiffeners (3) have hollowed-out portions (8).

9. The structure as claimed in either of claims 6 and 7, which includes at least one optical surface integrally formed with the stiffeners.

10. The structure as claimed in any one of claims 1 to 9, wherein the ceramic is composed of silicon carbide.

11. A process for manufacturing a laminated thermostructural composite structure having a compositional gradient, comprising the following steps:

a) machining of a preform in a porous refractory component, the preform having a pore volume content of greater than or equal to 80%;

b) application of a liquid composition, containing a ceramic precursor polymer and a refractory solid filler, to all the accessible surfaces of the preform, crosslinking of the polymer and conversion of the crosslinked polymer into a ceramic by heat treatment in order to reduce the porosity at the surface of the preform; and

c) formation of a ceramic coating by chemical vapor infiltration so as to form a ceramic shell over all the external surfaces of the preform.

12. The process as claimed in claim 11, wherein the preform is formed from a reinforcement of carbon fibers of the ex-rayon type, consolidated by a carbon matrix.

13. The process as claimed in claim 11 or 12, wherein step a) of machining the preform includes the hollowing-out of cavities (2) in the component made of composite in order to form stiffeners.

14. The process as claimed in claim 13, wherein the step of machining the preform furthermore includes the formation of a substantially plane surface (4), said surface being polished after the chemical vapor infiltration step in order to form an optical surface.

15. The process as claimed in any one of claims 11 to 14, wherein the liquid composition includes a solvent for the ceramic precursor polymer.

16. The process as claimed in any one of claims 11 to 15, wherein the solid filler comprises at least one refractory powder whose mean particle size is less than 100 microns.

17. The process as claimed in claim 16, wherein the mean particle size of the powder is between 5 microns and 50 microns.

18. The process as claimed in any one of claims 11 to 17, wherein the solid filler comprises at least two powders of different mean particle sizes.

19. The process as claimed in any one of claims 11 to 18, wherein the chemical vapor infiltration is carried out at a constant temperature.

20. The process as claimed in any one of claims 11 to 19, wherein the coating formed by chemical vapor infiltration is of silicon carbide.